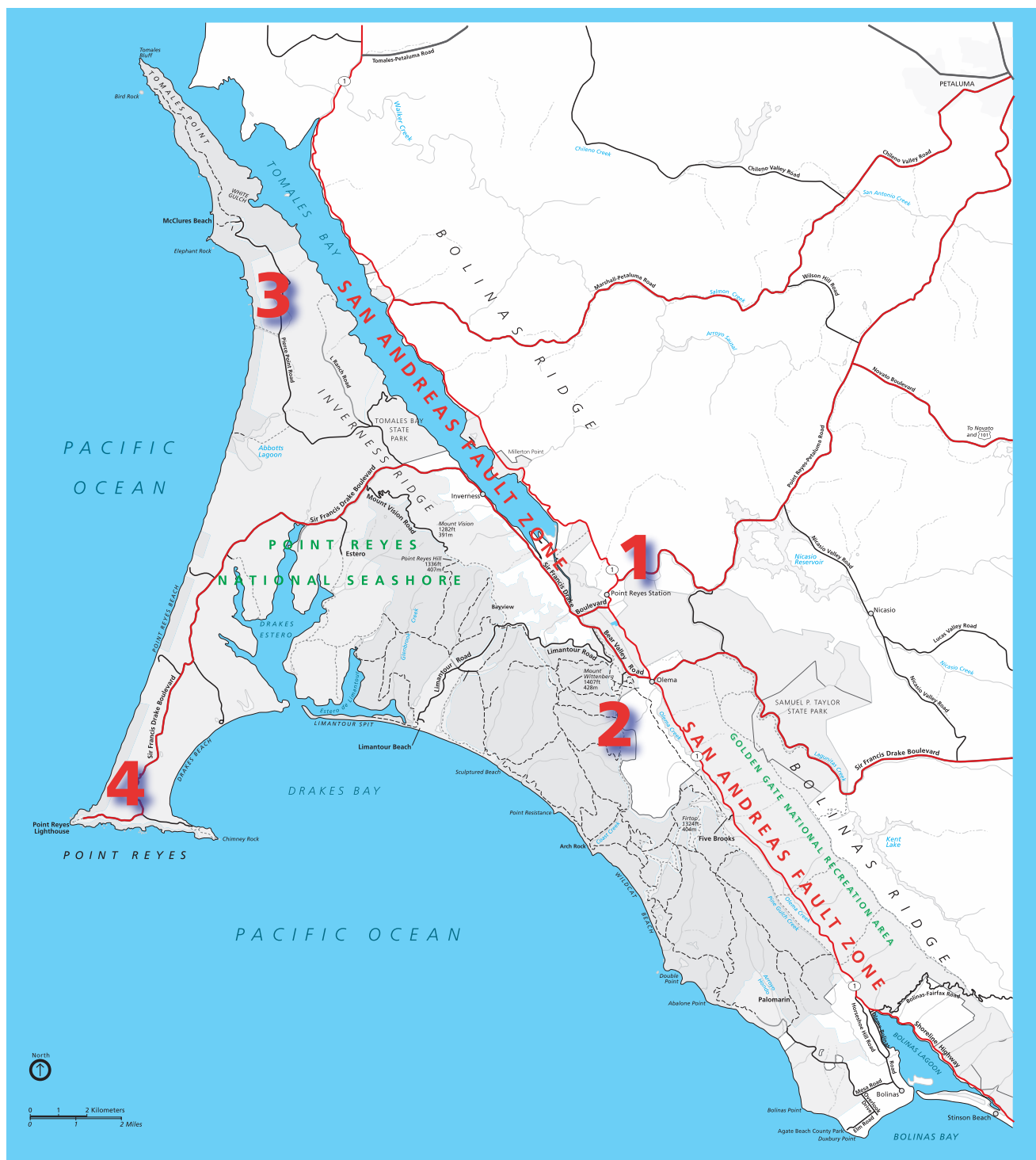


# Point Reyes Roadside Geology

Geologic processes over millions of years have shaped the changing landscape called Point Reyes. Moving as part of the Pacific Plate, the Point Reyes peninsula has been edging northward along the San Andreas Fault an average of 2 inches per year. About 7 million years ago, Point Reyes was approximately 80 miles to the south near San Gregorio, under seawater. Clues to this watery past are found alongside the roads and trails of the peninsula.

**1 Point Reyes—Petaluma Road**  
Large dark rocks lining road cuts along this prime route are a good place to look for clues about Point Reyes’ marine past. These lumpy, greenish-black formations are pillow basalts, igneous rocks created when magma cooled quickly underwater on the ocean floor. They are part of the Franciscan formation of the North American plate supporting the redwood forests and grasslands in this area.

**2 Bear Valley Area**  
Take a few minutes to walk the flat, ½ mile trail called the **Earthquake Trail**. As you reach the blue posts, the low round hill you are seeing is called a shutter ridge. Like a window shutter closing off light, the fault activity in this area has shut off the flow of water in the creek, changing from flowing north to Point Reyes into flowing east into Olema. Look for more shutter ridges along Highway 1 between Olema and Point Reyes Station.



## 3 Pierce Point Road Area McClure’s Beach

Travel through time from the oldest rocks to the youngest. Start your trip at McClure’s Beach. Core sampling reveals that the granitic rocks along this trail were formed some 89 million years ago and 7 miles beneath the surface of the earth. Along with the entire peninsula, they have migrated some 300 miles north from the Tehachapi Mountains near Los Angeles. Not only have these weathered granites traveled, they also have been uplifted by fault activity.

What geologists call an unconformity lies within the layers of rock along the trail. The 89 million year old granites are interspersed with much younger rock, called marine terrace deposits, which formed just below sea level and then uplifted along with the granite.

If you take the steep half-mile walk down to the beach, you’ll see the most ancient rocks in this area at the bottom of the trail: gneiss from the Sur series—metamorphic rock baked deep under the surface. The layered rock looks as if laid down as sediment, but the layering results from enormous compression. Minerals flows, including intrusions, and ribbon-like channels of granitic rock called dikes, can be seen in these ancient stones.

### Kehoe Beach

Take a look at the landscape near the restrooms next to the road. The rock is sandstone, a sedimentary rock, approximately 10-50 million years old. It formed as granite, was weathered by the elements, and eroded from beachfronts. Under a hand lens the sand reveals flakes of pink potassium feldspar, a mineral that originated in the granite.

Look to the north and right of the trail for a large white outcrop. It is a very soft diatomaceous tock, another clue to Point Reyes’ marine past. As it’s name indicates, diatomaceous rock comes from organic material such as diatoms and microscopic algae.

## 4 Point Reyes Area Drakes Beach

Step out onto the beach and take a quick look at the layered cliffs, called the Drakes Bay Formation, some of the youngest rocks on the peninsula.

Originally formed by marine deposits laid down underwater, the cliffs have been uplifted and weathered. You may note that the layers slope down toward Drakes Estero on the eastern end of the beach. This is evidence of the Point Reyes Syncline in which the rocks angle down from Drakes Beach towards the estero and then rise up on the Limantour Beach side. In the syncline, near the mouth of the estero, you can see the younger formations, normally out of view on the high cliff-tops, down near eye level.

In winter, the punishing waves remove the beach sand exposing the older layers of chert. This rock layer is re-covered by the returning beach sand in summer. The cliffs at Drakes Beach are very light-colored and are sometimes compared to the white cliffs of Dover in England, however, the Dover Cliffs are chalk, composed of much older marine sea shells.

### The Lighthouse

The 15-minute trail from the parking lot to the Visitor Center rewards you with views of a unique geologic feature that encompasses volcanic activity, earthquake faulting, and river action. These processes combine to create the commanding beauty at the end of the peninsula. The Point Reyes conglomerate looks like a cream colored layer cake rising behind the Visitor Center. Each layer has its own story. Ancient melting glaciers washed gravels and sands out to sea which combined with layers of mud, and waves of cobbles, the olive-sized rocks. These materials were stacked and compressed, then uplifted by earthquake activity. The conglomerate formation is 50 million years old, though embedded within it are older volcanic rocks. The round cobbles are as old as 120 million years. For example, the large reddish purple stones, called passionate purple porphyry for their color, are 140 million years old. Porphyry refers to volcanic rocks made up of large crystals in a fine grain base, volcanic material that cooled slowly allowing the crystals to form.

This is just a taste of the geologic smorgasbord of Point Reyes National Seashore. In the dynamic and compelling landscape around us, there is abundant evidence of the powerful effects of crashing plates and pounding seas.